(19) **RU** (11) **2083289** (13) **C1**

(51) 6 B03B5/62

James 169-73

RUSSIAN AGENCY
FOR PATENTS AND TRADEMARKS

(12) ABSTRACT OF INVENTION

(14) Document date: 1997.07.10
(21) Application number: 93047541/03
(22) Application filing date: 1993.10.12
(46) Documents claims only available: 1997.07.10

(71) Applicant information: Khrustalev M.I.
(72) Inventor information: Khrustalev M.I.
(73) Grantee (asignee) information:
Tovarishchestvo s ogranichennoj otvetstvennost'ju "VOSTORG"

(54) MULTIPLE-PRODUCT HYDRAULIC SORTER

FIELD: material sorting. SUBSTANCE: multiple-product hydraulic sorter to separate small-grain materials regarding their size and density contains vertical sorting chamber consisting of alternating cylindrical and conical sections with increasing upwards cross-section. Inside the chamber, vertical shaft is coaxially installed with attached to it radial-vertical partitions disposed in cylindrical sections. Stream splitters are made in the form of inclined pipes placed in upper conical sections and fastened to radial partitions. Discharge pipes are provided with removable accumulation-discharge facilities with shutoff valves. EFFECT: improved design. 4 dwg

This invention qualifies as a device designed for sorting small-grain materials according to the size and density (of particles) as occurs in the enrichment and classification of sand, ore, coal, and also for the sorting of slag by-products in the power generating industry.

The most similar invention to this one is the hydraulic sorter, which consists of a sorting chamber with an axial vertical shaft, that has radial partitions/blades, a dosing device, pipes for changing and discharging, water pipes and containers for sorted products (Copyright W117250, class B03B5/62, year 1958).

The above-mentioned device, if taken as a prototype, does not achieve the required technical result. It has a low effectiveness of sorting because the time that particles spend in the sorting zone is too short for particles to be properly separated. Therefore the quality of the output products is not high.

The patent search has not revealed any other devices similar overall to the invention described here.

The multiple-product hydraulic sorter (MPHS) contains a sorting chamber, which consists of alternating cylindrical and conical sections with increasing upwards diameter, which have stream splitters, a vertical shaft co-axial to the chamber, a pipe for charging equipped with a dosing device, discharging pipes, water pipes and containers for sorted products. The technical result of this invention is in the improved efficiency of sorting of small-grain materials. This is achieved by the inclusion in the sorting chamber of the MPHS inclined pipes which are located in the conical sections of the chamber and attached to ring-like horizontal grids connected to stream splitters. These stream splitters are made in the form of radial vertical partitions/blades connected to the vertical shaft of the sorting chamber. The containers for sorted products are removable and have regulating shut-off valves.

Fig. 1 shows MPHS
Fig. 2 shows cross-section A-A
Fig. 3 shows cross-section B-B
Fig. 4 shows cross-section C-C

MPHS contains dosing device (1) with emergency discharge pipe (2), pipe for charging sorter with unsorted pulp (3), sorting chamber (4), which consists of conical (5) and cylindrical (6) alternating sections. Inside the chamber and coaxial to it there is a vertical drive shaft (7) with attached radial partitions/blades (8). In the upper part of the sorting chamber (4) there is a motor

with a gearbox (10), which enables the operator to regulate the speed of shaft rotation. The bottom of the chamber contains a removable grid (11) and a ring-shaped container (12). Water is supplied to the container (12) through pipe (13). Discharge pipes (14) are attached to the cylindrical sections of the chamber (4) at different levels, one above the other and are in plan at an angle $\alpha = \frac{360^\circ}{n}$ to the charging pipe (3), where n is the number of partitions/blades.

This arrangement is necessary to separate the charge zone from the zone of discharge of sorted products. The drainage pipe (15) is attached to the upper part of the sorting chamber (4). Removable containers for sorted products (16) are attached to every discharge pipe and equipped with regulating shut-off valves (17).

Inclines pipes (9) are located in the three upper section of the sorting chamber (4), and are at an angle of 45° - 60° to the horizontal. These inclined pipes are attached to horizontal ring-like grids (18), which are connected to the radial partitions/blades (8), mounted on the drive shaft (7). The space between pipes (9) is filled with solid mass (for example, concrete).

MPHS works as follows.

Pulp of unsorted material enters the dosing device (1), which is located higher than the sorting chamber and has a pipe (2) for emergency discharge of pulp excess.

Pulp gravitates down the charging pipe (3) into the middle part of the sorting chamber (4), into space between the partitions/blades (8); there it is mixed with a rising stream of water, which is supplied by the pipe (13) through the contained (12) and grid (11).

Sorting of a small-grain material according to the size and density of particles throughout the height of the chamber (4) begins in the rising water stream; heavier particles gravitate down, the stream takes up lighter ones. As a result of this separation, bigger and heavier particles are accumulated at the bottom part of the chamber, smaller and lighter particles – in the top part, and particles of medium size and density – in the middle part. The smallest and lightest particles are taken away with the drain water. Rotation of the shaft with the radial partitions/blades spins the pulp in the chamber and centrifuge particles of each layer towards inlets of discharge pipes (14).

The rising stream of water keeps separating particles in the pulp simultaneously with mixing the pulp through the rotation of the shaft. The lower the speed of shaft rotation, the more accurately particles can be sorted into layers throughout the height of the chamber according to their size and

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density, and the more consistent is the product that enters the discharge pipes. The time and accuracy of sorting can be regulated to the requirements by changing the speed of shaft rotation.

The rising stream of pulp is divided inside the inclined pipes (9), located in the upper three sections of the chamber (4). Inclined streams ensure higher speeds of particle sorting at the same velocity of rising water stream. Due to this effect the fall of particles is considerably reduced and the cross-section of the chamber could be reduced accordingly.

As particles approach inlets of the discharge pipes (14), they are sucked in due to the concentration gradient and then gravitate to the containers for sorted products (16). The heaviest and largest particles are discharged through the lower pipe, small and light particles through the upper pipe, and medium sized particles and particles of medium density are discharged through the intermediate pipes. Sorted product fractions are collected in several removable containers, equipped with shut-off valves.

As sorted product builds up inside a removable container (16), it pushes up valve (17) that shuts off discharge pipe (14). Full container (16) is then removed and replaced by an empty container.

The smallest particles are taken away with the drain water through the drainage pipe. Drain water is either collected in a containment reservoir or discharged into the environment.

Formula of the Invention

MPHS consists of:

- sorting chamber made of alternating cylindrical and conical sections with diameter increasing upwards,
- dosing charging device,
- water supply device in the bottom part of the chamber,
- drainage pipe in the upper part of the chamber,
- vertical shaft, coaxial to the chamber, and radial partitions/blades attached to it in cylindrical sections of the chamber,
- stream splitters, which are located in the upper conical sections and are made of inclined pipes attached to partitions/blades,
- discharge pipes, which are attached to cylindrical sections of the chamber and are equipped with removable containers and regulating shut-off valves.

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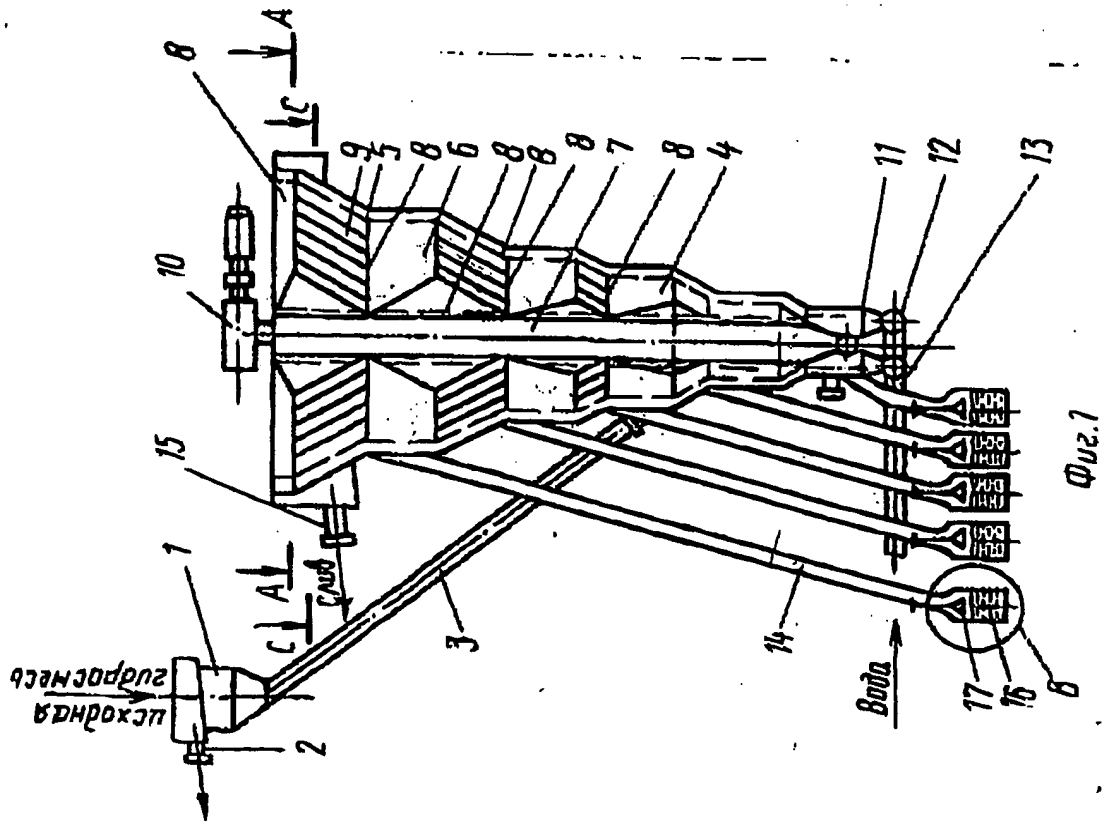

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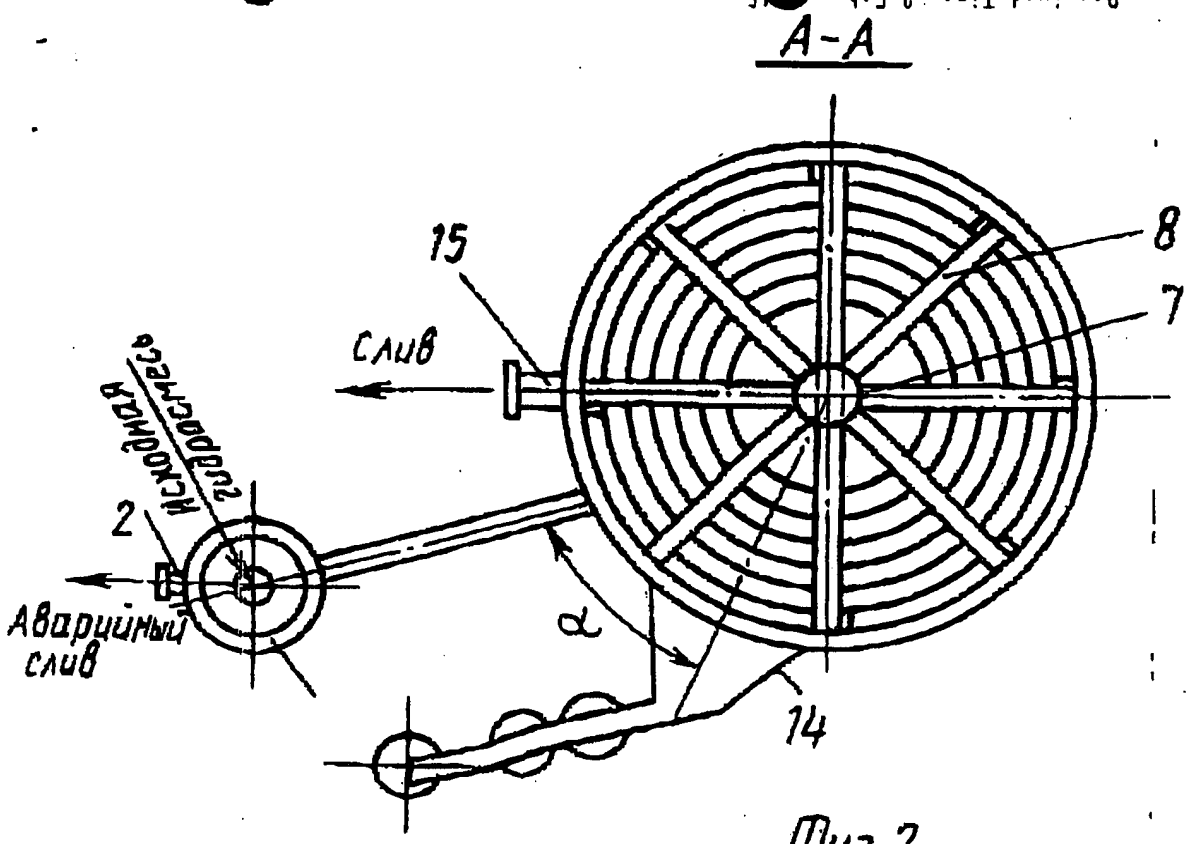

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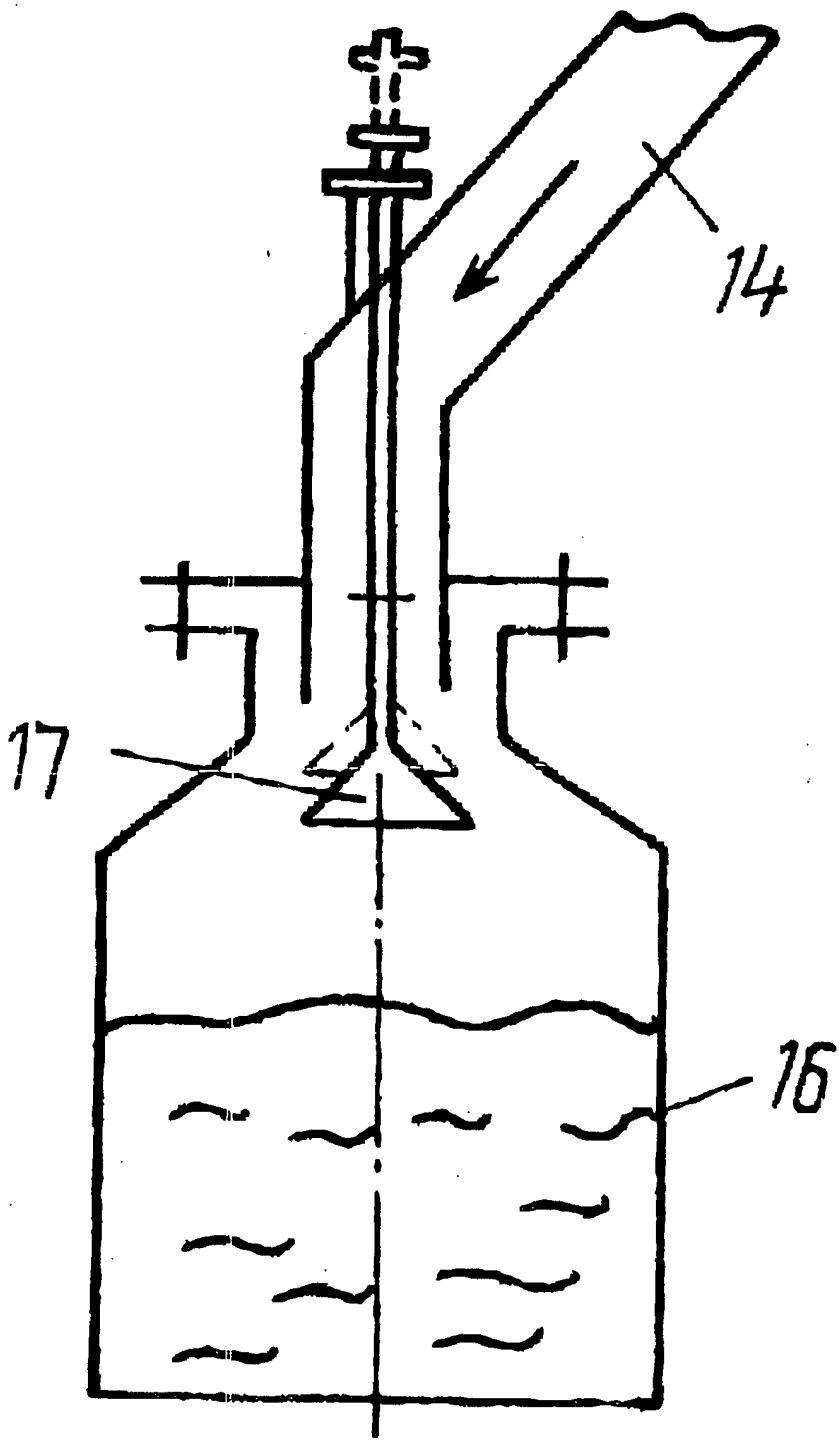

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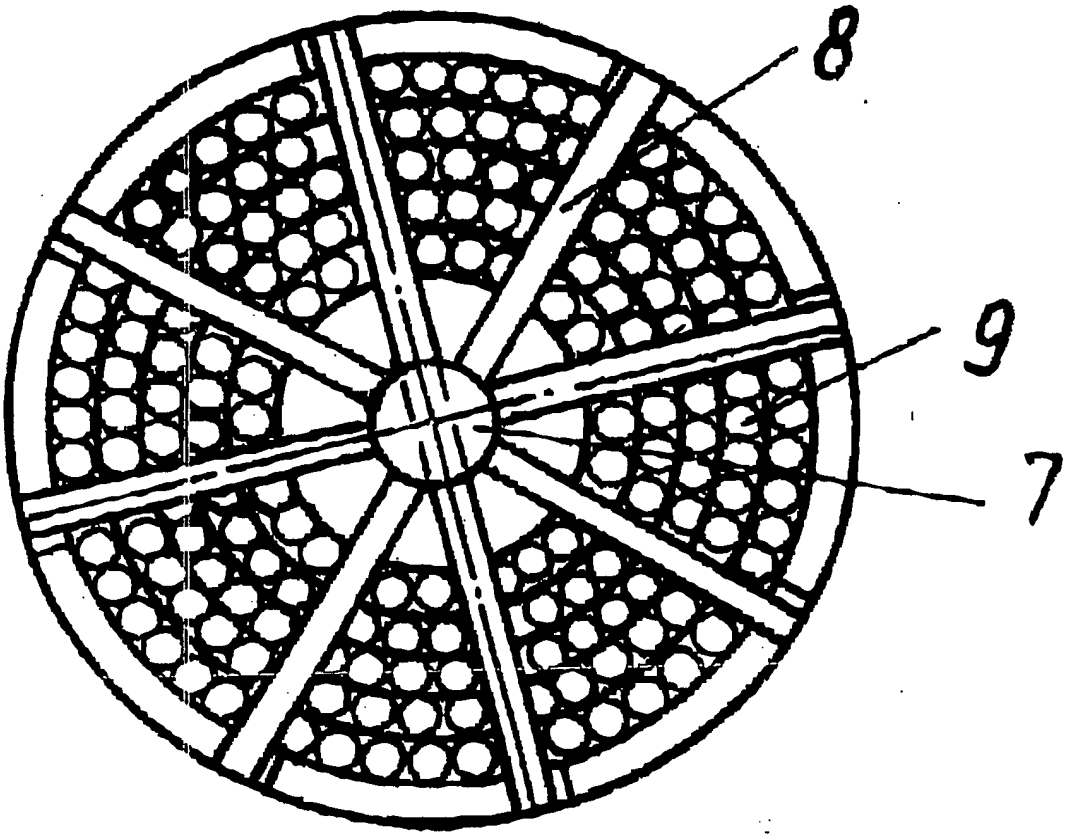

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